Description

Apparatus for fixing a power breaker in a withdrawable-part rack

The invention relates to an apparatus for fixing a power breaker in a withdrawable-part rack.

Power breakers, which can be inserted in a withdrawable-part rack, need to be able to be fixed in the withdrawable-part rack, in particular in the case of very high short-circuit currents, in order to be able to ensure functional reliability during operation of the power breaker. As a result of the arrangement of the current path in the power breaker, forces result which would produce a torque about the insertion shaft and would thus push the power breaker out of the withdrawable-part rack if insufficient fixing were provided. As a result, the region of overlap between the insertion blades of the power breaker in the isolating contact systems of the withdrawable-part rack would be reduced or eliminated. The formation of an arc associated with this may result in failure or destruction of the device.

In order to be able to fix the power breaker securely in the withdrawable-part rack, it is known to latch the power breaker in the withdrawable-part rack by means of a latching apparatus. In this case, holding systems are known which lock the power breaker using relatively short lever arms. If a strong force is introduced, the power breaker accordingly tends towards tipping movements, with the result that the mentioned disadvantages occur.

It is therefore the object of the present invention to provide an apparatus for fixing a power breaker in a

withdrawable-part rack, which fixes the power breaker securely in the withdrawable-part rack even in the event of very high forces and eliminates the abovementioned disadvantages.

According to the invention, this object is achieved by an apparatus for fixing a power breaker in a withdrawable-part rack having the features mentioned in claim 1. For this purpose, at least one locking means, associated with the withdrawable-part rack, is provided for the power breaker, said locking means being connected to a control rod, which is arranged movably on the withdrawable-part rack, for the purpose of moving it from a latched position to an unlatched position or vice versa, the control rod interacting with a means for moving the power breaker relative to the withdrawable-part rack, the apparatus furthermore comprising a release means, which can be moved by means of the power breaker from a blocked position for the control rod to a released position for the control rod or vice versa.

The apparatus according to the invention for fixing a power breaker in a withdrawable-part rack advantageously makes it possible for the power breaker to be locked in a simple and secure manner. As a result of the fact that this apparatus interacts with a means for moving the power breaker relative to the withdrawable-part rack, it is particularly advantageous to fix the power breaker as a result of the movement of the power breaker into the withdrawable-part rack and also to unlatch the power breaker owing to the withdrawal of the power breaker from the withdrawable-part rack. This means that no additional procedures, for example by an operator, are required for fixing the power breaker. This is desirable, inter alia, since it is not possible for the additional latching of the power breaker to be forgotten or to be carried out erroneously.

In one preferred embodiment, the locking means is in the form of a hook. Furthermore, the locking means is

advantageously mounted on the withdrawable-part rack such that it can rotate and is arranged such that it can engage in an attachment locked on the power breaker. The bearing point is in this case selected such

that, on the action of tipping forces which are produced owing to the arrangement of the current path in the power breaker, a closing moment of the locking means in the attachment of the power breaker and thus on the power breaker is always set.

In one particularly preferred embodiment, the locking means is a downwardly formed hook, which engages in an insert arranged in a force-fitting manner on the power breaker and thus holds the power breaker securely in the withdrawable-part rack even in the event of high forces.

The control rod is advantageously arranged on a side wall of the withdrawable-part rack and is connected in a force-fitting manner to the locking means by means of a bolt, a sliding piece and a spring. Furthermore, the control rod which is advantageously arranged such that it can move vertically has a spring applied to it which prestresses the control rod. The means for moving the power breaker relative to the withdrawable-part rack may comprise a displacement mechanism having a crank handle and an insertion shaft having a crankshaft journal. The release means is advantageously a transverse slide having a blocking tab which can be latched into a notch in the control rod. The transverse slide also advantageously has a spring force applied to it.

In the initial position in which the power breaker is still located outside of the withdrawable-part rack, the locking means is arranged in an unlatched position. The control rod connected to the locking means is held in a blocked position using the release means.

When the power breaker is inserted in the withdrawable-part rack, the release means is caused by the power breaker, only shortly before the end of the entire

displacement path, to move the control rod from a blocked position to a released position. As a result, the locking means connected to the

control rod is caused to be moved from its unlatched position to a latched position. As a result, the power breaker is fixed securely in the withdrawable-part rack.

When the power breaker is withdrawn from the withdrawable-part rack, on actuation of the means for moving the power breaker relative to the withdrawable-part rack the control rod is moved from the released position to the blocked position. As a result, the locking means connected to the control rod is moved from its latched position to an unlatched position and releases the power breaker which was up to that point fixed. On further actuation of the means for moving the power breaker relative to the withdrawable-part rack, the now unlatched power breaker is moved out of the withdrawable-part rack. In this case, the control rod is held in the blocked position by means of the release means, and the initial position is reached.

Further preferred refinements of the invention result from the other features mentioned in the subclaims.

The invention will be explained in more detail below in an exemplary embodiment with reference to the associated drawings, in which:

figure 1 shows a perspective illustration of a withdrawable-part rack having an apparatus according to the invention in the initial position with the power breaker not inserted;

figure 2 shows a perspective illustration of a withdrawable-part rack having an apparatus according to the invention during the insertion of the power breaker;

figure 3 shows a perspective illustration of a withdrawable-part rack having an apparatus according to the invention with the power breaker inserted and fixed;

figure 4 shows a perspective illustration of an apparatus according to the invention without a withdrawable-part rack, and

figures 5 and 6 show a perspective illustration of a power breaker, which is fixed in a withdrawable-part rack having an apparatus according to the invention.

Figure 1 shows a perspective illustration of an apparatus according to the invention, which is arranged on a withdrawable-part rack 10, the power breaker being partially inserted in the withdrawable-part rack 10. For greater clarity, only one attachment 24 of the power breaker 12 is illustrated. The apparatus for fixing the power breaker 12 in the withdrawable-part rack 10 is fixed on the side wall of the withdrawable-part rack 10 and engages, in the latched position, in the attachment of the power breaker 12. In the initial position, the control rod 14 is locked in a blocked position by the transverse slide 20, with the result that the locking means 16 is located in an unlatched position. The power breaker 12 is moved into the withdrawable-part rack 10 by means of a displacement mechanism, which has a crank handle 29 and an insertion shaft 30 having a crankshaft journal 32.

A locking means 16 is located at this point in time in its unlatched position. The locking means 16 is in the form of a hook and is connected in a force-fitting manner to the control rod 14 by means of a bolt 18, a sliding piece 40 and a spring 22. The control rod 14 is

arranged on the withdrawable-part rack 10 such that it can move vertically. Furthermore, the control rod 14 has a spring 42 which applies a force, which is directed vertically downwards, to the control rod 14. The vertical position of the control rod 14 is limited

in this initial position by the transverse slide 20, whose blocking tab 26 engages in a notch 36 in the control rod 14 and thus prevents a further vertical downward movement of the control rod 14. As a result, the locking means 16 is prevented from being moved from its unlatched position to a latched position. The transverse slide 20 likewise has a spring 28 (cf. figure 4), by means of which the transverse slide 20 is pushed in the direction of the notch 36 in the control rod 14. In the initial position, the crankshaft journal 32 is located to the side of the insertion shaft 30.

By actuating the displacement mechanism, the crankshaft journal 32 is moved upwards until it is located perpendicularly over the insertion shaft 30 in the insertion guide 44. At the same time, the power breaker 12 is moved into the withdrawable-part rack 10. The control rod 14 is moved upwards by means of the crankshaft journal 32. The locking means 16 is located on the stop 34, and the spring 42 is compressed, as illustrated in figure 2.

On further insertion of the power breaker 12 in the withdrawable-part rack 10, only on the last millimeters of the entire displacement path is the transverse slide 20 moved from a switch foot 38 of the power breaker 12 counter to the spring force of the spring 28, with the result that the transverse slide 20 is deflected rearwards and the blocking tab 26 of the transverse slide 20 becomes unlatched from the notch 36 in the control rod 14, as illustrated in figure 3.

Following the release by the blocking tab 26 of the transverse slide 20 owing to the spring force of the spring 42, the control rod 14 moves downwards. The downward path of the control rod 14 is limited by the crankshaft journal 32 of the insertion shaft 30, which

has moved downwards again owing to the further insertion. The downward movement of the control rod 14 causes the locking means 16, which is in the form of

a hook, to be brought into its end position and to engage in the attachment 24 of the power breaker 12. As a result, the power breaker 12 is fixed securely in the withdrawable-part rack 10.

Aside from the displacement of the power breaker 12 into the withdrawable-part rack 10, no further procedures advantageously need to be performed for the purpose of fixing the power breaker 12. Furthermore, the bearing point of the locking means 16 is selected such that, on the action of tipping forces on the power breaker 12, a closing moment of the hook-shaped locking means in the attachment 24 of the power breaker 12 is always set. The hook thus falls downwards and holds the power breaker 12 securely in the withdrawable-part rack 10.

In order to unlatch and remove the power breaker 12 from the withdrawable-part rack 10, the presence of play between the crankshaft journal 32 and the insertion guide 44 is utilized. Within the first rotations of the crank handle for the insertion shaft 30 on the displacement mechanism, owing to the play no movement is produced on the power breaker 12. On these rotations of the crank handle, the crankshaft journal 32 is moved slightly upwards and lifts the control rod 14 with the locking means 16 connected thereon upwards. As a result, the locking means 16 is moved from its latched position to an unlatched position. The power breaker 12 is as a result released and can be removed from the withdrawable-part rack 10 by further rotating the crank handle. On further rotations of the crank handle on the displacement mechanism, the crankshaft journal 32 is moved further upwards in the insertion guide and displaces the power breaker 12. On the resultant upward movement of the control rod 14, the spring 42 of the control rod 14 is stressed. At the

same time, the transverse slide 20 is displaced, owing to the force of the spring element 28, into the notch 36 in the control rod 14 again, as illustrated in figure 2. On further rotations of the crank handle, the crankshaft journal 32 is moved downwards

again in the insertion guide 44, the spring 42 of the control rod 14 is relieved of stress, and the control rod 14 is again located in the initial position, as illustrated in figure 1.

Figure 4 shows a schematic perspective view of an apparatus according to the invention without a withdrawable-part rack. In this case, the hook-shaped locking means 16 is connected in a force-fitting manner to the control rod 14 by means of a bolt 18, a sliding piece 40 and a spring 22 and, corresponding to the abovementioned operation, engages in the attachment 24 on displacement into the latched position if the transverse slide 20 releases the control rod 14 by the blocking tab 26 becoming unlatched from the notch 36 in the control rod 14.

Figures 5 and 6 show the apparatus according to the invention for illustrative purposes together with a power breaker 12, which has been completely inserted and fixed in a withdrawable-part rack 10. In both figures, the locking means 16 is located in its latched position. By actuating the crank handle, the crankshaft journal 32 is moved upwards, as a result of which the control rod 14 likewise experiences a vertical upward movement. Owing to the play between the crankshaft journal 32 and the insertion guide 44 of the displacement mechanism, the power breaker 12 initially does not move. This is not possible until the control rod 14, owing to its vertical upward movement, moves the locking means 16 from the latched position to the unlatched position and, as a result, unlatches the locking means 16 from the attachment 24 of the power breaker 12 and thus the fixing is released.